

Global Water Cycle

Introduction

Very, very large. On a global scale the units used are 1000 km^3 or 10^{18} g water. Remember the density of water is 1 g cm^{-3} .

If all the water that fell on earth in one year would be uniformly distributed the average depth would be 70 cm.

[examine the global hydrologic cycle]

The Oceans

- Contain 97% of the water on earth. The world's oceans hold $1,350,000,000 \text{ km}^3$ of water and the average residence time is ~ 3100 years.
- $425,000 \text{ km}^3$ of water evaporate over the ocean, of this $385,000$ precipitates over the ocean leaving $40,000 \text{ km}^3$ to be transported over land.

The Atmosphere

- very little water is held in the atmosphere. In an average column of air there is only 0.3 cm of water.

The Land

- 'Water water everywhere and not a drop to drink' – only 3% of the world's water is fresh water. Of this

Glacier Ice	77%
Ground Water	23%
Snow, soil moisture, rivers, lakes, etc.	01%
- However, global averages obscure the extreme spatial variations that occur in the hydrologic cycle and are so important to human endeavors.

... my notes sort of decay here, but some things to remember.

- 1) Potential Evapotranspiration (PET)– the maximum evaporation possible under a given set of climate conditions

2) Actual Evapotranspiration (AET)– the evaporation that actually occurs.

Very hard to measure.

For a rainforest $PET \sim AET$. For a desert $PET \gg AET$.

Also remember that there is multiple recycling of water vapor from the land surface to the atmosphere. For example as rain moves from the eastern to western amazon, it may be recycled 2 to 3 times. It is possible to see the processes using oxygen isotopes.

River flow

Rivers carry between 33,500 and 47,000 km³ of water from the land to the sea. The most commonly cited number appears to be 42,000 km³. This water is very unevenly distributed. For instance the world's 50 largest rivers carry 43% of the total river flow with the Amazon leading the way. There are large differences in the amount of runoff by continent as well. For instance the average runoff for North America is 32 cm /year, while for Australia it is 4 cm / year.

Also be aware that considerable effort has been spent in trying to model how the land surface and atmosphere interact in terms of hydrology and these landsurface hydrology models include such things as:

- Precipitation
- Evaporation from the soil
- Transpiration from leaves
- Water movement in the soil profile
- Overland runoff